

# **AS/A Level Applied Information and Communication Technology 9713**

## **Unit 11: Databases & Charts**

### **Recommended Prior Knowledge**

Students will require a basic knowledge of and some practical skills in database creation and use using database facilities. Students will also need a basic knowledge of, and some practical skills in the development of graphs and charts using a charting package. In preparation for this module it is recommended that the material from IGCSE IT (syllabus 0418) has been covered, especially the whole of section 11 (Data Manipulation) and 13 (Output Data).

This should include the following:

- accurately enter data
- load/open stored data
- import data
- define database record structures
- format fields
- sort data (alphabetical/numeric, ascending/descending)
- select data by specified criteria (AND/OR/NOT)
- use arithmetic operations / numeric functions to perform calculations
- save data for use in text-based document
- produce reports with specified fields, titles and layout
- export a report for use in another package
- produce graphs and charts with specified data series
- label and manipulate graphs and charts
- print reports

In preparation for this unit you could cover the following topics: handling passwords to gain access to the operating system, applications software and data.

Students will also need a basic knowledge of file management techniques including:

- creating, renaming, deleting and access to directories/folders
- browsing a directory or folder
- creation of different file types

### **Context**

This sub-unit can be studied on its own or in conjunction with other practical units. There is no requirement to study any other units prior to this one.

## Outline

This unit covers the following areas:

The use of database and charting software to:

- create a database structure
- add data to this structure
- organising the data using the most efficient and appropriate structure.
- link data tables
- create and use relationships
- check data entry
- select subsets of data using one or more criteria
- sort data using one or more criteria
- enter formula/e to calculate results
- enter formula/e to manipulate string values
- use the display features of the package to produce an electronic or printed report with selected data and fields
- group data
- summarise data
- export the data into a format that can be used in a different package
- produce an appropriate type of graph or chart with suitable labels

Candidates will also need to:

- manually verify data entry
- understand the purpose of validation and verification

AO	Learning outcomes	Suggested Teaching activities	Learning resources
11a(i)	Create a database structure and add data to this structure, organising data using the most efficient and appropriate structure.	<p>Teach defining a database structure on your database package which may include one or more relationships between data tables, This package must enable students to assign text, numeric (including integer, decimal, currency and percentage), Boolean/logical (yes/no 0/1 or true false) as well as date and time fields.</p> <p>The package must also be able to group data and produce summary data (for example: cross-tab queries, count, average etc). Revise the importance of using meaningful (yet reasonably short) file and field</p>	A variety of prepared data files of different types including generic file types like .csv, .txt, .rtf, and those with vendor specific extensions for databases (like .mdb files).

AO	Learning outcomes	Suggested Teaching activities	Learning resources
		names.	
		Students practise locating the files, open, import (with a variety of file types including generic files) and key in data as part of setting up a database structure.	
11a(ii)	Link data tables	<p>Discuss the advantages and disadvantages of flat-file databases, compared to relational databases, and where it is more appropriate to select one type or another.</p> <p>Teach the need for a database to have key fields in terms of the organisation of data. Set key fields in data tables, including setting primary key fields.</p> <p>Discuss the requirement for primary key fields to be unique identifiers which can not hold duplicate data. Discuss the advantages and disadvantages of flat-file databases, compared to relational databases.</p>	<p>Descriptions of the functions of a number of databases with information about the fields required to enable students to create data structures including both flat-file and relational solutions. Examples are:</p> <ul style="list-style-type: none"> <li>• School student records</li> <li>• Utility billing</li> </ul>
11a(iii)	Create and use relationships	Teach and allow students to practise the creation of different relationships between fields in different tables. Students should be able to identify and create relationship types like one-to-one and one-to-many.	Descriptions of the functions of a number of databases with information about the fields required to enable students to create data structures including relationships between multiple (3 or more) tables.
11a(iv)	Check data entry	Revision on the students' understanding of the purpose of both validation and verification. Revise methods of validating and verifying data and selecting the right method for different applications.	<p>Exercises in data entry and manual verification of the data entered.</p> <p>Exercises in setting and testing validation rules applied to individual fields.</p>
11b	Select subsets of data using one or more criteria	Revision and practise searching using the logical operators for LIKE, is equal to, is not equal to, less than, greater than, greater than or equal to and less than or equal to.	Prepare databases with a variety of data types, to enable a variety of search techniques.

AO	Learning outcomes	Suggested Teaching activities	Learning resources
		Revision of searching using Boolean logic, AND, OR and NOT, including using AND searches to search for data within a specified range.	
		Revision of searching using wildcard searches to find items starting with, ending with, or containing specific characters or strings.	
11c	Sort data using one or more criteria	Teach sorting the database in its original (table) format and sorting the database at run time (within a report). Sorting should be on all field types and be both ascending and descending.	Prepare databases with a variety of data types, to enable a variety of sorting exercises, at table level and in report generation.
11d	Enter formula/e to calculate results	<p>Teach the use of arithmetic operations/numeric functions to perform calculations using both calculated fields which are calculated at run time and calculated controls (within reports) which are calculated at run time.</p> <p>Calculations should include basic mathematical operators (addition, subtraction, multiplication, division) as well as functions such as sum, average, maximum, minimum and counting.</p>	Prepare databases with a variety of numeric fields to enable practice calculations to be performed using all the required operators, formulae and functions.
11e	Enter formula/e to manipulate string values	<p>Teach the use of functions within the database package to extract substrings from an original field using left, right, and mid substring commands.</p> <p>Use formulae to return the length of a string or the numeric value of a string. If these functions can not be found in your database package, then exporting fields into a spreadsheet and performing the manipulation prior to importing the result as a new field/s would be acceptable.</p>	

AO	Learning outcomes	Suggested Teaching activities	Learning resources
11f(i)	Use the display features of the package to produce an electronic or printed report with selected data and fields	<p>Teach the design of reports for both electronic and printing methods of output. This should involve the use of manually designing reports rather than just relying on wizards to generate pre-defined page layouts.</p> <p>Data alignment (for example left, right and centre aligned) and displaying the data in specified formats (like percentage values, currency, decimal with a specified number of decimal places and integer values). Students must be taught how to hide controls containing both data and labels, and in reverse how to show hidden controls.</p> <p>Students must be familiar with ensuring that they can print out evidence of the calculations/formulae used. All controls within a report should be edited so that all data and labels are fully visible, without any truncation.</p> <p>Teach the use of headers and footers in the context of printed (database generated) reports.</p> <p>The headers should include the page header, section header and report header and the footers should include the report footer, section footer and page footer.</p> <p>This should include the placing of calculated controls within these sections in order to produce a variety of different results.</p> <p>Students must ensure good page layout without overlapping or compressed data and labels.</p> <p>Students must also practise producing a range of reports such as label production and personalised invitation generation.</p>	Prepare databases with a variety of data types, to enable a variety of reports to be created.
11f(ii)	Group data	Teach the production of a grouped report, including the use of a grouped header and footer. Group data by more than one field.	Prepare databases with a variety of data types, to enable grouped reports to be created.
11f(iii)	Summarise data	Use the features of the database to produce summary data, with functions like sum, average, counting, maximum, minimum, first occurrence of... etc. Also develop the use of cross-tab queries (sometimes called pivot tables) to produce two dimensional summaries	Prepare databases with a variety of data types, to enable a variety of summaries to be created.

AO	Learning outcomes	Suggested Teaching activities	Learning resources
11f(iv)	Export the data into a format that can be used in a different package	<p>of the data.</p> <p>Teach the exporting of data (in different formats such as tables, queries or reports) into a common text format (like .csv, rtf and .txt). Develop an understanding of the advantages, disadvantages and appropriate uses of each of these formats. Export the data into a format that can be used by a charting package.</p>	
11f(v)	Produce an appropriate type of graph or chart with suitable labels	<p>Discuss the uses of each type of chart, and which type is the most appropriate type for which function.</p> <p>Use the exported data to select the most appropriate chart type for the application. The chart types could be bar, pie, line graph, comparative bar chart and comparative line graph , the data series (contiguous or non-contiguous) selected and labels (title, legend, segment labels, percentages, category axis labels, value axis labels, series labels and scales) must also be appropriate to the application.</p> <p>Axes must be adjusted as appropriate (by defining maximum and minimum values) and secondary axes may also be required.</p> <p>Place, move and resize the chart as specified, particularly if it is to be integrated into a document/report. Ensure that all chart elements (particularly labels) are fully visible.</p>	Prepared data sets designed for a variety of chart production.